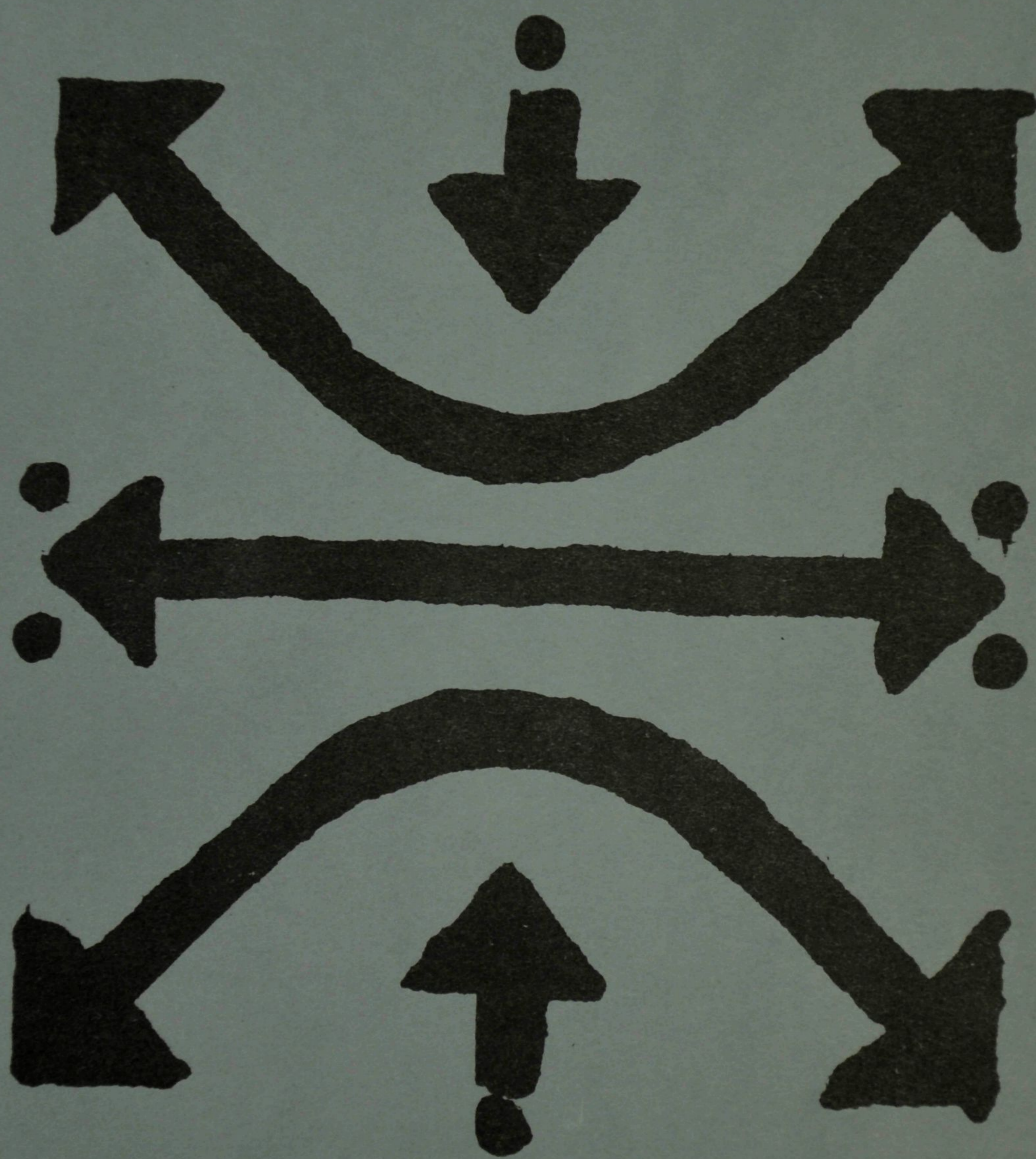


ENGINEERING OPEN HOUSE

March 10 & 11, 1972



PHYSICS DEPARTMENT
UNIVERSITY OF ILLINOIS

TRANSISTOR AND SEMICONDUCTOR DEVICES (Main Floor Lobby)

Transistors and semiconductors have revolutionized our way of life. Research and development in this field have allowed us to build huge computers and send men to the moon. The development of the transistor is intimately related to progress in solid state physics, in particular, since World War II. Dr. John Bardeen of the U. of I. was on the team of researchers who invented the transistor at Bell Telephone Laboratories in 1947. For this, he and two other researchers were awarded the Nobel Prize in Physics in 1956.

On display are many semiconductor devices, a model of the first transistor, integrated circuit chips, and some special devices. Kurt Schoenburg, Dave Dowell, Patricia Millard, Mark North, and Bill Merritt will be on hand to demonstrate and explain their uses.

CONTROLLED THERMONUCLEAR FUSION RESEARCH (Room 151)

In view of the predicted crisis resulting from the depletion of our energy resources, it is essential that we look for new methods of generating power. Nuclear engineers and plasma physicists are currently looking for a method of maintaining and controlling thermonuclear fusion. Once this is found, fusion reactors will replace present-day coal and nuclear power plants. The great advantage is that we will then have an inexhaustible fuel reservoir, in the form of "heavy water" from the oceans, for use in energy production. Lectures on the techniques of plasma generation and confinement will be given every hour on the hour in Room 151.

Student lecturers are Len Peterson, Meka Papa Rao, Mark Janke, Kevin Pavero, and LeRoy Nolle.

PLATO (Main Floor Lobby)

Since its initiation in 1959, the PLATO program at the University of Illinois has been committed to the exploration of the possibility of using a modern high-speed digital computer as an active element in the educational process. To this end, three successive and increasingly versatile systems (PLATO I, II, and III) were designed and built. A small PLATO III teaching facility was installed in 1964 and has been in continuous use since then. PLATO IV, which is on display, is a continuation of this design effort. It combines major improvements, such as the high resolution display, with major cost reduction. The goal is to reduce the cost to 50¢ per student contact hour, a cost far below that of any other system presently available.

Plato programs which will be available to Open House guests include 1) a program that allows the "student" to shoot a projectile from earth to moon and back; 2) two men throwing rocks at each other over a mountain, the object being to hit the other man; 3) a man walking through a maze; 4) fruit fly reproduction.

Students working on this project are John Van Rosendale, Jay Williams, Mike Billings, and Jim Kocol.

INTRODUCTORY PHYSICS LABS AND LECTURES

By popular request we are again presenting introductory physics lectures in Room 141. In addition to being interesting to the general public, they provide Open House guests an opportunity to sit down for a while. Lectures are being presented at times scheduled outside the lecture room. Between the lectures, films on superconductivity and the nature of liquid helium are being shown.

In Room 164 are demonstration experiments usually performed in introductory physics labs. These experiments illustrate some of the basic principles of physics. As a special feature, DeWayne Husser will explain the operation of a neutron beam "chopper" which he constructed last fall in the Physics 303 lab.

SUPERCONDUCTING LINEAR ACCELERATOR (LINAC) (at Physics Research Lab)

One of the tools essential to research in nuclear physics is an electron accelerator. The University of Illinois's new Linac will produce an intense, monochromatic beam of high energy electrons. By using superconducting cavities, the electrons can be accelerated to much higher energies than those attainable in a conventional accelerator of comparable size. The Open House Bus will travel from the engineering campus to the Physics Research Lab. Steve Selbrede and Fred Heard will conduct tours through the facility.

NATIONAL ACCELERATOR LABORATORY (NAL) (Main Floor Corridor)

Last week the new accelerator at Batavia, Illinois produced the first 200 GeV beam of protons. These protons were the most energetic ever produced by man. When completed, NAL will be the world's largest accelerator facility producing protons of energies up to 400 GeV for use by physicist studying high energy particle interactions. The University of Illinois has a number of physicists working at NAL already.

Since the main ring of the accelerator is approximately four miles in circumference, we could not possibly bring the accelerator down to Urbana for the weekend. We do, however, have a pictorial display in the corridor of the main floor. The exhibit will convey an idea of the size of the new facility. It also shows how imaginative planning can improve the environment rather than spoil it. A small spark chamber similar to those used to detect high energy particles is set up.

SUPERCONDUCTIVITY (Main Floor Lobby)

Many metals and alloys become superconducting at extremely low temperatures, losing all trace of resistance to the flow of electricity. A current once started flowing in a loop or coil will flow indefinitely with no battery or other source of power. Discovered in Leiden, Holland in 1911, the explanation of this remarkable phenomenon remained an outstanding puzzle of physics for nearly fifty years. In 1957, at the University of Illinois, a theory was given by J. Bardeen, L. N. Cooper, and J. R. Schrieffer which accounted for most of the known facts and predicted new phenomena since observed in the laboratory. The explanation is based on quantum theory. The theory of superconductivity has been expanded and further developed by many people in subsequent years.

Superconductivity has been an area of great interest in recent years. Some of the applications of superconductivity in physics are superconducting magnets, linear accelerators, SQUID's, and standardization of the volt. Two technically very promising applications are in power transmission and high speed mass transit systems. The superconductivity display will have demonstrations of perpetual current in a ring as described above, zero resistance in a wire as it becomes superconducting, and magnetic levitation which is used to lift trains for high speed transportation. There will also be posters showing the other applications.

Students working on this project are Randy Hall, Mike Lowry, Bill Cralley, Alan Ray, and Andy Bralley.

LIQUID CRYSTALS (Room 137)

Liquid crystals are a class of compounds which do not pass directly from the solid to the isotropic liquid state when melting. Instead they first pass through the liquid crystalline state. In this state, while being fluid, the molecules still maintain some of the orderliness of the solid. Patterns of colors may be observed by passing polarized light through the liquid crystal and observing through a polarizer. This pattern results from the quasi-crystalline properties of the liquid crystal.

Students working on this display are Tyrus Monson, Ed Almquist, and John Brtis.

HOLOGRAPHY (Room 136)

The 1971 Nobel Prize in Physics was awarded to Dr. Dennis Gabor who developed a method for producing a 3-dimensional picture. This picture is called a hologram. Wave-front reconstruction is the principle involved and is now finding use in medical technology.

Several holograms are on display and students will be conducting mini-lectures on the principle of wave-front reconstruction. There will also be simple demonstrations with optical instruments to facilitate the understanding of holograms.

Students working on this project are Ray Marion, Fred Davenport, Cordell Bishop, and Bill Backs.

BUBBLE RAFT (Room 136)

In 1949, Sir Lawrence Briggs came upon a method for demonstrating, with good approximation, the microscopic processes involved in crystal lattice formation. A model made of soap bubbles predicts the results of tests on crystals. The bubbles are large and easily observed. They make an ideal theoretical tool in developing our knowledge of lattice formation. Properties which can be demonstrated are lattice dislocations, sheer stress, and cleavage planes. By vibrating the bath, the raft demonstrates thermal motion in the lattice.

Students working on this project are Norm Markworth, Bob Wagner, Ken Jezeck, and Mark Cascia.

LASER MODULATION (Main Floor Corridor)

A laser beam can easily be modulated so that information may be transmitted on the beam. We are modulating the beam with a television signal. A TV camera is set up and Open House guests can observe themselves on a monitor.

Students working on this project are Peter Krupp, Steve Rupp, Gordon Weast, and Randy Schaeffer.

LISTENING TO WALLS (Room 144)

This is a simple demonstration of the Doppler Effect and interference. The principle is the same as that used to detect speeding automobiles with radar. In detecting speeding cars, the car reflects the radar. Since the car is moving, the reflected beam has a different frequency. By measuring the magnitude of this frequency shift, the speed of the car can be determined.

In this demonstration a mirror is attached to a wall and a laser beam is directed onto the mirror. Since the wall is moving due to vibrations within it, the reflected beam has a shifted frequency just as the radar beam reflected from the car. By mixing the reflected beam with the incident beam, the magnitude of the shift can be determined. This mixing produces "beats", approximately one beat every 1/100 to 1/1000 of a second. Hence, the beat frequency is in the audio range and can be amplified and heard.

Students working on this demonstration are Mike Stoll, Bob Smith, Becky Yocom, and Mike Bitz.

SPATIAL FILTERING (Room 144)

Spatial Filtering is a method of image processing whereby unwanted information is removed from wanted information in a picture. A typical application in photography is the removal of grids from satellite photographs. On display in Room 144 are several photographs of images before and after spatial filtering. The equipment used in the process is also set up. Paul Meier and Bill Franks will explain the technique.

DISPLAY GENERATOR COMPUTER (Main Floor Corridro)

The Display Generator Computer (DGC) is a programmable digital computer with a memory capacity of 128 8-bit words. The memory can be used to store both programs and data. The DGC has several internal registers one of which drives two 4-bit digital-to-analog converters. The outputs of these converters control the horizontal and vertical deflection of an oscilloscope beam. By changing the contents of the register, the beam can be moved to any one of the 256 locations on the screen and patterns may be displayed.

The DGC was constructed by John Lufkin in Physics 344 class. Also working with him are Ed Kinney and Phil Rich.

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